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## Intelligence Report

Office of Resources, Trade, and Technology

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### Foreign Investment Opportunities in China's Electric Power Market

#### Summary

For the past several years, China has had chronic and widespread electric power shortages. To ease the situation, the Chinese have embarked on an ambitious plan to increase installed capacity from the current 180 gigawatts (GW) to 300 GW by 2000. Longer range plans call for capacity to more than double again by 2010—to 650 GW—and to have installed capacity of 1,000 GW by 2020.

we have compiled a list of 112 electric power projects totaling roughly 185 GW that China plans to complete over the next 20 years:

- Nearly 80 of the plants—with a capacity of 95 GW—will be fueled by coal.
- Hydroelectric plants—including the massive Three Gorges Project in Hubei Province—will provide 77 GW of additional capacity.
- Another 14 GW will come from nuclear plants.

Beijing publicly concedes that it cannot finance all of these projects itself. For their part, foreign investors see China as the world's largest market for electricity-generating facilities, technology, and equipment.

We estimate that the total costs of projects slated by 2015 may exceed \$285 billion, with foreign investment needs topping \$100 billion.

Despite the huge market that China's plans imply, foreign investors have identified many obstacles to doing business in the country.

Some of the more serious obstacles include:

- **Inadequate rates of return.** Beijing limits the rate of return foreign investors can earn on power projects to 12 percent.

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## Appendix B

### China: Struggling To Address Pollution Concerns

The Chinese have begun to examine ways to deal with growing concerns about pollution from coal-fired generating plants.<sup>13</sup> Chinese leaders recently said: "Great attention should be paid to environmental protection and the seriousness of environmental issues which are the result of the energy structure in which coal is the main energy source,"

At a recent energy seminar in Beijing, senior officials from China's State Planning Commission (SPC) outlined government policies in the Ninth Five-Year Plan (1996-2000) that emphasize coal washing as the "technique of choice,"

Only 20 percent of China's current coal output—180 million tons annually—is washed.

Industry experts maintain that the Chinese will need more expensive, sophisticated technologies to reduce sulfur emissions caused by burning coal. Only one Chinese power plant is equipped with desulfurization equipment. China Huaneng Group, the Chinese company that built the plant, was able to cover the cost of installing the antipollution devices only because the government agreed to raise electricity rates to users, according to the Group's president. Another facet of China's environmental protection plans is to increase use of clean-coal technologies. In particular, SPC officials have said publicly that Beijing will promote use of fluidized bed combustion (FBC) boilers between

<sup>13</sup> A recently released government report stated that coal discharges 18 million tons per year of sulfur dioxide into the atmosphere. Industrial pollution, however, is not the main cause of China's air pollution problem. The main sources of pollution are millions of small factory boilers and household stoves that burn unwashed coal at low temperatures. Although the government hopes that half the urban population can eventually be supplied with clean natural gas for cooking, rising gas prices and short supplies may undercut that effort, according to press reports.

<sup>14</sup> Coal washing removes dirt particles and rocks for more efficient burning

now and 2000, which China will have to import because it lacks domestic capabilities to manufacture large-scale FBCs

#### Seeking Foreign Assistance

The Chinese are also getting outside help to address pollution concerns and secure advanced technologies. For example:

- China and the United States have undertaken a prefeasibility study on technology designed to convert coal reserves to natural gas for use in combined-cycle power plants—plants that produce electricity directly from gas turbine/generator units and subsequently from a steam turbine/generator unit that uses exhaust heat from the gas turbines. This technology—known as integrated gasification combined cycle (IGCC)—will be the main type of boiler that China plans to use after 2010.<sup>16</sup> The US Department of Energy in 1994 proposed that the United States grant China \$50 million for a demonstration IGCC plant; the appropriation is pending.

<sup>15</sup> Fluidized bed combustion technology uses coal or other solid fuels to produce electricity by combusting them while they are "fluidized"—lifted and kept in constant motion by jets of compressed air. There are two types of FBC technologies: atmospheric and pressurized. The Chinese are developing a pressurized FBC pilot plant, according to the Embassy. (c nF)

<sup>16</sup> Integrated gasification combined cycle (IGCC) is a combination of coal gasification and combined-cycle gas turbine technologies. Coal is gasified to produce a synthetic gas—similar to natural gas—that is burned in gas turbines to generate electricity. Gas turbine exhaust gases pass through a heat-recovery steam generator to make a steam to power a steam turbine generator that produces additional electricity.

[redacted] Japan in December 1994 committed \$264 million to Chinese environmental aid through Japan's Official Development Assistance (ODA) program. The additional funds bring Japan's ODA contributions to nearly \$400 million since 1992. According to an industry journal, Japan's Ministry of International Trade and Industry (MITI) is providing support for two projects involving flue gas desulfurization systems through its multimillion-dollar Green Aid Plan.<sup>17</sup> Japanese firms Mitsubishi Heavy Industries and Hitachi are involved in the projects. In addition, according to press accounts, Tokyo is underwriting an environmental center in Beijing to showcase anti-pollution technology.

• [redacted] Finland has dedicated unspecified government loans to be used primarily for Chinese power plants that incorporate clean-coal technologies.

These agreements notwithstanding, China would need substantial additional financial help to develop clean energy sources. Mou Guangfeng, a deputy director in China's National Environmental Protection Bureau, estimates that the country needs \$300 billion through 2000 for antipollution equipment alone. At the same time, Mou claims that typical sources of aid for such technologies—foreign governments and international lending agencies—have more limited budgets than in

<sup>17</sup> A flue gas desulfurization system removes environmentally harmful sulfur dioxide from combustion gases by reacting the sulfur dioxide with limestone (calcium carbonate) to create gypsum (calcium sulfate), a solid that can be safely incorporated into consumer products. [redacted]

the past. For example, Mou said that the World Bank has provided \$20 billion to China for a number of environmental protection projects and is not prepared to do much more, according to press accounts. [redacted]

[redacted] total World Bank lending for environmental projects was \$600 million in 1993. [redacted]

[redacted] In addition, China's National Environmental Protection Agency has instituted an emissions tax on existing plants that pays for installing coal scrubbers on some of the worst units. The tax is passed on to consumers in the form of higher electricity prices. Despite these efforts, the size of China's expansion program and the continuing dependence on coal for power generation will mean that there will be a net increase in harmful emissions in China in the next several years, [redacted]

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Figure 3  
China: Electric Power Infrastructure

